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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,355	01/16/2001	Randhir P.S. Thakur	303.275US2	6066

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EXAMINER	
BOOTH, RICHARD A	
ART UNIT	**PAPER NUMBER**
2812	10

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/761,355	Applicant(s) THAKUR ET AL.	
	Examiner Richard A. Booth	Art Unit 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence addr ss --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *42,43,59 and 72-99* is/are pending in the application.

4a) Of the above claim(s) *42,43,59 and 72-78* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *79-99* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1-13-03 has been entered.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 42-43, 59, and 72-78, drawn to an interconnect structure, classified in class 257, subclass 740.

II. Claims 79-99, drawn to a method of making an interconnect structure, classified in class 438, subclass 618.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by

another and materially different process, for instance, the product can be formed by a process which does not use elevated pressures.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Charles E. Steffey on 1-24-03 a provisional election was made without traverse to prosecute the invention of group II, claims 79-99. Affirmation of this election must be made by applicant in replying to this Office action. Claims 42-43, 59, and 72-78 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double

patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 79-99 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,174,806 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims in the instant application are broader than those of the patent.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 79-86 and 90-99 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf in view of Chu, U.S. Patent 5,783,471 and further in view of Dobson, U.S. Patent 5,527,561.

Wolf shows the invention as claimed including forming Al-TiN-Ti-Si contacts that are formed through depositing a layer of titanium on a substrate at a thickness of 300-800 angstroms, followed by forming titanium nitride thereover, annealing to react the titanium with the substrate and form titanium silicide, and forming either an overlying aluminum or tungsten layer (see section 3.6.2). Concerning annealing to form the silicide layer in an inert or nitrogen ambient and the particular aspect ratio of the trench, official notice is taken that such an ambient is well known in the art to be used to prevent contamination of the device structure and that the claimed aspect ratio was commonly used at the time the invention was made.

Wolf fails to expressly disclose forming a metal line on the conductive material over the contact hole and forming the aluminum or tungsten layer by a CVD process utilizing a pressure of at least 1.1 atmospheres.

Chu discloses forming a metal line (316 or 317) overlying a conductive interconnection structure (see fig. 3O and col. 4-lines 55-59). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Wolf as suggested by Chu because this would allow for communication with other active regions in a memory array.

Dobson shows the invention substantially as claimed including forming either a metal layer, for instance, of aluminum 10 or a dielectric layer, for instance, of silicon dioxide (see column 4, line 64 - column 5, line 4) in a hole or trench structure 3 and then subjecting the structure to an elevated temperature of 350-400 celsius and an elevated pressure of greater than 3000 psi to form ,for instance, in the case of a metal a via which has a metal fully incorporated therein (see column 7, lines 49-52). Regarding the pressure and temperature parameters used when reflowing the dielectric, these parameters would be determined through routine experimentation depending upon, for example, the amount of pressure or elevated temperature deemed necessary to properly fill the opening and would not lend patentability to the instant application without the showing of unexpected results. Dobson fails to show force-filling at a pressure greater than 1.1 atmospheres. However, a prima facie case of obviousness has been established because overlapping ranges establish a prima facie case of obviousness (see MPEP 2144.05). Furthermore, it would have been obvious to use the process of Dobson to force-fill the conductive layer in the primary reference of Wolf because this allows for the void free filling of high aspect ratio vias.

Claims 87-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf in view of Chu, U.S. Patent 5,783,471 and further in view of Dobson, U.S. Patent 5,527,561 as applied to claims 79-86 and 90-99 above, and further in view of Gardner et al., U.S. Patent 5,679,585.

Wolf, Chu, and Dobson are applied as above but fail to expressly disclose annealing the supporting substrate in a processing chamber at a pressure of at least 1.1

atmospheres and a temperature of less than 700 degrees celsius to form the titanium silicide.

Gardner et al. discloses depositing a titanium layer 30 (see column 6, lines 52-57) on a polysilicon layer 14, for example, and performing an anneal at a temperature of less than 550 celsius (see column 6, line 65) and at a pressure of at least 2 atmospheres (see column 7, lines 15-21) in the presence of an inert gas such as nitrogen (see column 7, lines 50-55). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform elevated pressure processing as disclosed in Gardner et al. in the primary reference of Wolf because the higher pressure ensures thermal contact of heated, flowing gas across the substrate especially in small geometries where silicide is to be formed (see abstract).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is 308-3446. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 308-3325. The fax phone numbers for the organization where this application or proceeding is assigned are 308-7724 for regular communications and 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-1782.

Richard A. Booth
Primary Examiner
Art Unit 2812

January 24, 2003